

## **Listing of Claims**

1. (Currently Amended) A method of controlling the coupling of multi-platform reservoir and network simulators comprising:
  - providing an open message-passing interface ~~capable of communicating that communicates~~ with black oil model reservoir simulations, compositional model reservoir simulations, and different types of surface networks;
  - initiating a first reservoir simulation for one or more physical parameters of a first reservoir in a first reservoir simulator, the first reservoir simulation using a first fluid model;
  - initiating a second reservoir simulation for the one or more physical parameters in a second reservoir in a second reservoir simulator, the second reservoir simulation using a second fluid model;
  - applying synchronization steps to the advancement through time of the first reservoir simulation executing on a first computing device and the second reservoir simulation executing on a second computing device, each synchronization step enabling different simulation tasks to take non-identical time steps, wherein each simulation task of the first reservoir simulation and the second reservoir simulation advances independently to the next synchronization step using corresponding time steps and Newton iterations uniquely suited to the individual simulation task;
  - translating each of a first hydrocarbon fluid stream of the first reservoir simulation and a second hydrocarbon fluid stream of the second reservoir simulation to a common fluid model of a controller by converting pseudo-components of each of the first hydrocarbon fluid stream and the second hydrocarbon fluid stream to a super-set

of pseudo-components used in the first reservoir simulator and the second reservoir simulator; and

performing a production operation based on the first reservoir simulation of the first reservoir simulator and the second reservoir simulation of the second reservoir simulator, the first reservoir simulation performed on the first computing device and the second simulation performed on the second computing device using the converted hydrocarbon fluid streams.

2. (Previously Presented) A controller for coupling multi-platform reservoir and network simulators comprising:

means for interfacing via open message-passing with different types of simulation tasks including black oil model reservoir simulations, compositional model reservoir simulations, and different types of surface networks;

means for initiating a first reservoir simulation for one or more physical parameters of a first reservoir in a first reservoir simulator, the first reservoir simulation using a first fluid model;

means for initiating a second reservoir simulation for the one or more physical parameters in a second reservoir in a second reservoir simulator, the second reservoir simulation using a second fluid model;

means for applying synchronization steps to the advancement through time of the first reservoir simulation executing on a first computing device and the second reservoir simulation executing on a second computing device, each synchronization step enabling different simulation tasks to take non-identical time steps, wherein each simulation task of the first reservoir simulation and the second reservoir simulation advances independently to the next

synchronization step using corresponding time steps and Newton iterations uniquely suited to the individual simulation task;

means for translating each of a first hydrocarbon fluid stream of the first reservoir simulation and a second hydrocarbon fluid stream of the second reservoir simulation to a common fluid model of the controller by converting pseudo-components of each of the first hydrocarbon fluid stream and the second hydrocarbon fluid stream to a super-set of pseudo-components used in the first reservoir simulator and the second reservoir simulator; and

means for performing a production operation based on the first reservoir simulation of the first reservoir simulator and the second reservoir simulation of the second reservoir simulator, the first reservoir simulation performed on the first computing device and the second simulation performed on the second computing device using the converted hydrocarbon fluid streams.

3. (Previously Presented) The controller of claim 2 additionally comprising means for balancing the coupled multi-platform reservoir simulators, including means for apportioning global production and injection rates between the simulation tasks of the first reservoir simulator and the second reservoir simulator.

4. (Previously Presented) The controller of claim 3 additionally comprising means for balancing the coupled multi-platform reservoir simulators and a surface network, including balancing the surface network with the global production and injection rates apportioned between the simulation tasks of the first reservoir simulator and the second reservoir simulator.

5. (Canceled)

6. (Previously Presented) The controller of claim 2, wherein the means for initiating the first reservoir simulation initiates a first reservoir simulation that comprises a black oil model in the first reservoir simulator and the means for initiating the second reservoir simulation initiates a second reservoir simulation that comprises a compositional model in the second reservoir simulator.

7. (Previously Presented) The controller of claim 2, further comprising means for coupling additional multi-platform reservoir simulators in addition to the first reservoir simulator and the second reservoir simulator, wherein the additional multi-platform reservoir simulators run a mixture of black oil models with different sets of active phases and compositional models with different sets of pseudo-components.

8. (Previously Presented) The controller of claim 2, wherein the first reservoir simulator and the second reservoir simulator run on different computer platforms.

9. (New) The method of claim 1 additionally comprising:

balancing the coupled multi-platform reservoir simulators, including apportioning global production and injection rates between the simulation tasks of the first reservoir simulator and the second reservoir simulator.

10. (New) The method of claim 1 additionally comprising:

balancing the coupled multi-platform reservoir simulators and a surface network, including balancing the surface network with the global production and injection rates apportioned between the simulation tasks of the first reservoir simulator and the second reservoir simulator.

11. (New) The method of claim 1, wherein initiating the first reservoir simulation comprises initiating a first reservoir simulation that comprises a black oil model in the first reservoir simulator and wherein initiating the second reservoir simulation comprises initiating a second reservoir simulation that comprises a compositional model in the second reservoir simulator.

12. (New) The method of claim 1, further comprising:

coupling additional multi-platform reservoir simulators in addition to the first reservoir simulator and the second reservoir simulator, wherein the additional multi-platform reservoir simulators run a mixture of black oil models with different sets of active phases and compositional models with different sets of pseudo-components.

13. (New) The method of claim 1, wherein the first reservoir simulator and the second reservoir simulator are run on different computer platforms.

14. (New) A computer readable storage medium containing instructions, which, when executed by a computer, perform a process comprising:

interfacing via open message-passing with different types of simulation tasks including black oil model reservoir simulations, compositional model reservoir simulations, and different types of surface networks; initiating a first reservoir simulation for one or more physical parameters of a first reservoir in a first reservoir simulator, the first reservoir simulation using a first fluid model;

initiating a second reservoir simulation for the one or more physical parameters in a second reservoir in a second reservoir simulator, the second reservoir simulation using a second fluid model;

applying synchronization steps to the advancement through time of the first reservoir simulation executing on a first computing device and the

second reservoir simulation executing on a second computing device, each synchronization step enabling different simulation tasks to take non-identical time steps, wherein each simulation task of the first reservoir simulation and the second reservoir simulation advances independently to the next synchronization step using corresponding time steps and Newton iterations uniquely suited to the individual simulation task.

15. (new) The computer readable storage medium of claim 14, further comprising instructions which, when executed by the computer, perform a process comprising:

translating each of a first hydrocarbon fluid stream of the first reservoir simulation and a second hydrocarbon fluid stream of the second reservoir simulation to a common fluid model of the controller by converting pseudo-components of each of the first hydrocarbon fluid stream and the second hydrocarbon fluid stream to a super-set of pseudo-components used in the first reservoir simulator and the second reservoir simulator; and

performing a production operation based on the first reservoir simulation of the first reservoir simulator and the second reservoir simulation of the second reservoir simulator, the first reservoir simulation performed on the first computing device and the second simulation performed on the second computing device using the converted hydrocarbon fluid streams.

16. (New) The computer readable storage medium of claim 14, further comprising instructions which, when executed by the computer, perform a process comprising:

balancing the coupled multi-platform reservoir simulators, including apportioning global production and injection rates between the simulation tasks of the first reservoir simulator and the second reservoir simulator.

17. (New) The computer readable storage medium of claim 14, further comprising instructions which, when executed by the computer, perform a process comprising:

balancing the coupled multi-platform reservoir simulators and a surface network, including balancing the surface network with the global production and injection rates apportioned between the simulation tasks of the first reservoir simulator and the second reservoir simulator.

18. (New) The computer readable storage medium of claim 16, wherein initiating the first reservoir simulation comprises:

initiating a first reservoir simulation that comprises a black oil model in the first reservoir simulator and wherein initiating the second reservoir simulation comprises initiating a second reservoir simulation that comprises a compositional model in the second reservoir simulator.

19. (New) The computer readable storage medium of claim 16, further comprising instructions which, when executed by the computer, perform a process comprising:

coupling additional multi-platform reservoir simulators in addition to the first reservoir simulator and the second reservoir simulator, wherein the additional multi-platform reservoir simulators run a mixture of black oil models with different sets of active phases and compositional models with different sets of pseudo-components.

20. (New) The computer readable storage medium of claim 16, wherein the first reservoir simulator and the second reservoir simulator are run on different computer platforms.